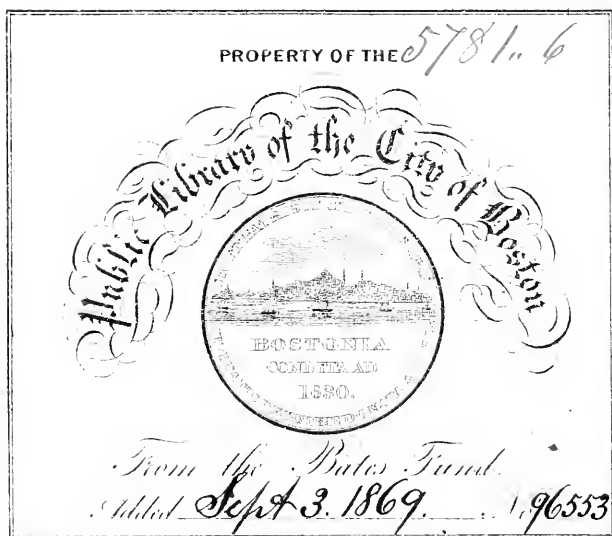


HOOPING - COUGH

DR MARTYN.

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HOOPING-COUGH :

ITS PATHOLOGY AND TREATMENT.

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

HOOPING-COUGH:

ITS PATHOLOGY AND TREATMENT.

BY PATRICK MARTYN, M.D. LOND., B.L.,

SURGEON IN HER MAJESTY'S FLEET.

DISCOVERER OF THE FUNCTION OF THE THYROID BODY OR VOCAL BRACE,
(COLLIGATOR VOCALIS,) ETC. ETC.

"In Physics, the eyes, ears, and all the senses, for demonstration.
In Metaphysics, thought, reason, and argument, for conviction.
In Practical Science, both, for proof."

Philosophy Made Easy.



LONDON:

JOHN CHURCHILL & SONS, NEW BURLINGTON STREET.

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P R E A M B L E.

THE object of the writer of this short treatise, is briefly to show the great importance of whooping-cough, and to point out the reasons on which that importance depends—that it attacks great numbers of children at certain seasons of certain years;—that it attacks children only, and them in severity in proportion to the degree of their infancy; that it is returned by the Registrar-General of deaths, &c., more fatal than any other disease in earliest infancy;—that it is believed to be an infectious disease;—that its many and serious complications are preventible;—that it is so intractable and protracted, that the little success that has attended the prevailing treatment of it, has made it a reproach against the profession. To show that an evitable, factitious, and unnecessary importance and dread attach to it; and that this is owing to the uncertainty, dissent, and want of unanimity of pathologists as to the nature of the disease, its seat, and cause:—that

uncertainty of doctrine leads to uncertainty and variety of treatment, and as in most cases of want of success, to desperate treatment, administering the deadliest poisons to those least able to bear them, through constitution and infancy. To show that a clear and correct and unanimous understanding of its nature, should we now for the first time be so fortunate as to discover it, could not fail to lead to a consistent, uniform, confident, and safe treatment, that would render the complaint, though still perhaps obstinate, more tractable.

His object is also to offer to the profession a simple and obvious explanation of the nature of the disease, its seat, its cause, and other phenomena; to suggest a treatment that is simple and easy to be carried out, that will require little change or variety, and no dangerous drugs; a treatment that he has proved to be successful.

And finally, to advise all that an extended experience may enable him, as means of prevention, which may be found the most important and desirable part to parents and those having the charge of children.

MALVERN WELLS,

June, 1869.

HOOPING-COUGH.

CHAPTER I.

THE SUBJECT.

Occasion.—In the beginning of this year, 1869, thirty cases of hooping-cough came under my care, and afforded me a good opportunity of studying anew the disease, and of observing, as I had done before, the unsatisfactory state of its pathology.

Name.—A scientific nomenclature saves definitions of disease, by indicating its nature; but as that is not determined here, such a name cannot yet be given, so we use the old characteristic one, as more descriptive than any of its synonyms compounded of an affix expressing only violence. This essay may probably lead to the adoption of a pathological and definite one.

History.—Its history begins after the revival of literature in Europe. The ancients have left no account of the complaint. It is not one that occurs in tropical or subtropical climates, or on the shores

of the Mediterranean Sea, or in the contiguous regions in which the Greeks, the Romans, and the Arabs observed and wrote. With considerable experience of disease in those parts, I never saw or heard of a case of hooping-cough; as it belongs specially to a cold or temperate, a damp, inequable, and changeable climate and locality.

Literature.—Its literature is as unsatisfactory as its pathology, and shows the fact which I have often observed, that the less that is determined with certainty on any subject, the more is written on it: and this is pre-eminently exemplified in hooping-cough, for the Bibliography of Dr. Copeland's valuable dictionary gives a catalogue of near two hundred special works or essays written authoritatively on the subject. It would serve no useful purpose to give their titles or the names of their authors here. But the various and numerous theories of its pathology which they have propounded, making the prevailing doctrine of the disease, will be given in the next chapter.

CHAPTER II.

ITS PREVAILING DOCTRINE.

THE authorities who have written on whooping-cough are not unanimous or consistent in their theories of its pathology ; they represent it variously as

A catarrhal disease.

A bronchial disease.

A disease of all parts of the lungs and of the respiratory system.

A nervous disease affecting the respiration.

A disease of the brain and membranes affecting the lungs.

A disease of the medulla oblongata.

A disease of the spinal cord and of the respiratory tract.

A disease of the special respiratory nerves, as the pneumogastric or phrenic.

That its seat and cause are in the blood.

That its seat and cause are in the stomach and bowels.

That its seat and cause are in the liver, secondarily affecting the lungs.

That it is caused by a certain miasm in the air.

That it is caused by a certain insect.

This list reads like a dozen diseases, rather than one. It would save much perplexity, had the authorities laid it down as a disease subject to many modifications and complications; but they do not pronounce it so, but as a malady whose nature, seat, and cause are founded as variously, and explained by theories as different and numerous, as is stated above. Theory is of little consequence in most matters, but in this one it is of very great, because it rules the practice, which, like its prompter, is various, inconsistent, and different, and often dangerous.

Now this race of pathologists do not put forth or adopt, in equal numbers, each of these children, illegitimate I will call them, of the parent disease, but some take to some, and some to others, so that their respective opinions are as difficult to trace as a genealogical tree, and as little worth the pains.

If there was only one theory, all would believe it; if there were only two, we would believe one of them. But twelve! eleven of them must be wrong, then which is the right one? I believe not one of them.

What is it in this disease, that so many experienced, clever, and conscientious men, some of

whom deservedly receive the homage of all the medical world, should see it—the same disease,—in twelve different aspects, and give it twelve different causes and explanations. It must be that their theories are not founded on true pathology, that is, on a critical examination and study of the natural structure and function, as well as on the altered structure and function of the parts engaged in the disease. No amount of reasoning or speculation can bring a problem in practical medicine to a successful issue, that is, to an exact and scientific one, such as can be verified by the scrutiny of all the senses. As far as I can read or learn, I cannot find any description of, and rarely even an allusion to the natural structure of the part to which the two constant and characteristic symptoms of whooping-cough point, and which structure is remarkable; but I find that many morbid appearances observed and described, are not considered in relation to that primary structure, or to priority or sequence in progress, or to direction in locality and region; but some are taken for the cause of the disease that are plainly its consequences. Conclusions and oversight like this can lead only to a misconception and an inconsequent deduction of facts and phenomena, to illogical reasoning, and to a concocting of hypotheses no better than far-fetched guesses.

I have read the latest treatise in the English language on the subject, one of a recent collection,

and I accept it as the best. The author, Dr. E. Smith, F.R.S., gives a lucid description of the prevailing doctrine and practice, without attempting to explain the cause of the number and variety of the theories in vogue, or to assimilate, reduce, or reconcile them, so that the latest account makes an exposition only of doubt, difficulty, and danger, not presented by any other disease; doubt of what the disease is, difficulty of knowing what to do in it, and danger of doing the wrong thing. He touches the darkness without penetrating it, when he says "our knowledge is most limited and vague when we attempt to analyse the conditions attending early life which may be presumed to lead to the occurrence of this disease." Now it so happens that this condition of early life is that on which we have the most ample and certain knowledge, the most obvious and easy to be acquired: the knowledge of the anatomy of the larynx of the infant. Certainly all that is written on whooping-cough is vague and unpractical, and its literature is as unsatisfactory as its pathology.

CHAPTER III.

ITS SEAT AND STRUCTURE.

THE ancient philosophers did not confound themselves about the seat of the soul more than modern pathologists do about the seat of whooping-cough. The watchmaker has the advantage of the physician in opening and examining the engine taken to him to repair, and seeing the cause of its stoppage or derangement. Though the physician cannot do this, he has the advantage of the philosopher, the manifestations of whose arcanum are made in every part of the body, whereas those of our disease are made only in one; and though on that one part we cannot bring the scrutiny of sight, we can that of hearing and of the other senses, made more comprehensive by the knowledge of physical and physiological science.

The anatomical examination of the part engaged is more instructive, resulting, and conclusive in this disease than in any other; because in this it requires not a morbid example, which is not always

easy to be got, to show its seat and nature. These may be demonstrated in the natural, unaltered structure. The two constant and characteristic symptoms, the cough and the hoop, both the production of the glottis, indicate that place as partly the seat of the disease. The only other marked symptom in the matured and uncomplicated complaint, is a secretion of tough glutinous matter that can be discovered only in the top of the wind-pipe; so that the upper sensitive part of the trachea and the glottis together may be presumed to be the seat of hooping-cough.

Such a seat, at the entrance of the great vital apparatus of respiration, will account for the great importance of the disease; and an examination and understanding of the part and of its several relations, which we must tarry for here, will explain all the symptoms.

The larynx is the vestibule of the trachea or passage to the lungs. It is a part of the body that, though immature, is perfect at birth, because it is necessary for the life of the infant, by breath; for its care and protection, by crying and calling; for its sustenance, by sucking; and for its protection against suffocation by the intrusion of foreign bodies or of noxious or irrespirable gases, by its sensitiveness and smallness. The glottis, rima glottidis, or passage for the air, is very small, and grows larger very slowly. It is a mere fissure between the

chordæ vocales, which are in contact and fixed in front, and separate at a scarcely appreciable width and are moveable behind; it is, in a child one year old, only three lines or a quarter of an inch long (see fig. 3, page 28); at two years it is very little more; at five years it is about four lines; at ten years it is five lines; and at fifteen or puberty it is six lines, or about half an inch. It then suddenly enlarges, according to sex, constitution, and development, and at adult age, even in the male, it is scarcely an inch long, with proportional angular width. (See fig. 1, page 20.)

We are able by means of the laryngoscope to observe at the latter age the glottis, with the chordæ vocales in repose and in action; but in youth, and especially in infancy, from the smallness and sensitiveness of the parts, that is impossible.

Disease of the glottis is fortunately very rare, else it would scarcely ever fail to become fatal. But though not much subject to disease itself, owing to its extreme smallness in infancy, it greatly aggravates the diseases of contiguous parts, as of the top of the trachea in whooping-cough.

The glottis is the portal of life, which is breath, and it is therefore well guarded, well watched and guarded, by the laryngeal nerves, which are two, both from the great respiratory or pneumogastric, from the inferior ganglion of which the superior or sensitive branch descends, and as may be concluded

from the place of its departure, gives to the surface of the larynx and to the upper part of the trachea that extremely acute sensitiveness, ever awake, ever watchful, that instantly perceives the contact or intrusion of any body whatever from without, or the presence of any foreign body, or product of the individual, natural or morbid, within; and the approach of any noxious vapour. Which intrusive body or matter is as instantaneously repelled and expelled by the sudden and violent action of the diaphragm and respiratory muscles, ever active, ever protective, which are brought to the co-operation of the larynx, by the inferior laryngeal nerve, or recurrent branch, which does not part from its main stock, until it reaches the chest, the better to secure this association and sympathy, and then ascends, and is distributed to all the muscles of the larynx except one, the thyro-cricoid, modifying and adapting the opening of the glottis to the expulsive action of the respiratory muscles.

The lower part of the trachea is endowed with only common sensation. I have known foreign bodies such as small coins, pebbles, buttons, dice and even nails, having passed the upper and most sensitive part, give little trouble in the lower, if they did not obstruct by their bulk or irritate by their points.

The reason that the thyro-cricoid muscle is excepted, and not supplied by the recurrent, is, that

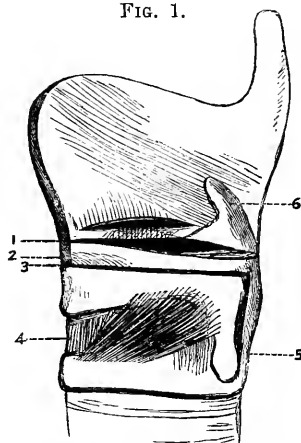
it is the muscle that closes the valve of the glottis, and should not act in antagonism to the respiratory muscles closing that passage when it should be open. It receives nerves from both branches of the superior or sensitive laryngeal, so that it may simultaneously, with the necessity of it, close the glottis involuntarily as well as voluntarily against anything, water, or noxious gas or vapour.

To those who write so much about spasm of the glottis in whooping-cough, this is an important muscle. The valve-like closure of the glottis, which is its special and sole action, is one of the most important mechanical movements in the body. And notwithstanding that, in all the anatomical books I have seen, the muscle is incorrectly named, and the action of the structure of the valve incorrectly described. I will take this opportunity of giving the view I think correct of it here:—

The cricoid cartilage is a bent lever of the first order—the only lever of that order in the body, the mechanical advantage of which is to economize force, and of the bend to economize space. The bend is where the back expands upwards from the horizontal hoop; at that point, at the bottom, is the fulcrum, which is the articulation of the cricoid to the thyroid; and this is constructed by a slight articular projection from the outer lower posterior surface of the cricoid, being received and rotating in a shallow cavity in the inner expanded end of the

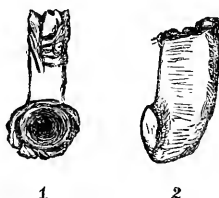
lower cornu of the thyroid cartilage, the joint being enclosed by a capsular ligament. (See figs. 1 and 2)

FIG. 1.



Sketch, upper half in section of the larynx and cricoid cartilage, showing — 1. Ventricle of larynx. 2. The glottis, open, and chordæ vocales. 3. The cut edge of the lower half of the left ala of the thyroid. 4. The thyro-cricoid muscle. 5. The crico-thyroid articulation, or fulcrum of the lever. 6. Arytenoid cartilages, of which the top of the nearer one is removed to show the whole length of the glottis.

FIG. 2.



Articulation of left lower cornu of the thyroid cartilage, with the cricoid cartilage presented to view. 1. Expanded end of cornu, with shallow cavity and capsular membrane. 2. Portion of cricoid, showing the globular articulating surface.

The moving power is the thyro-cricoid muscle, which arises expanded from the lower outer surface and corner of the thyroid cartilage ; it concentrates obliquely downwards and forwards, and is inserted into the upper edge of the anterior or longer arm of the cricoid cartilage. Its action is to raise the front of the cricoid cartilage to the thyroid, and at the same time rotating that lever on its fulcrum or articulation to the thyroid, it moves the top of its bent or perpendicular arm backwards, drawing firmly together and lengthening the chordæ vocales, and perfectly closing the glottis, which it does with great force, quickness, and precision. The arytenoid muscles aid in keeping the glottis closed.

CHAPTER IV. .

STRUCTURE AND PHYSIOLOGY.

THE provision and arrangement by which the larynx commands the instantaneous and consentaneous sympathy and services of distant parts of the respiratory system, and by it co-operates in many important functions and faculties, such as speech, and the mechanical powers of the body, is one of the most complete, simple, and admirable in all the animal economy.

The human chest, chest by pre-eminence, is a powerful mechanical engine. Besides the great vital function of respiration which it enables the lungs to perform, removing a recrementitious gas and vapour from the body, and drawing in, in its place, fresh air to vivify the blood, and warm the system, it is an engine of multiple power. Borelli, when he calculated the mechanical properties and power of each of the members and organs, and of certain vital processes of the body, over-estimated those of the heart, but under-estimated those of

the chest. With the glottis closed, the chest, distended with air serves as a great caisson, giving firm foundation for increased action of the arms, as the solid ground does for the feet, and enabling the body to lift and sustain great weights, to resist and repel by resilience great shocks, to give buoyancy to the body in swimming and diving, and to save from drowning, when the glottis closes against the influx of the water both voluntarily and involuntarily. I have seen this power often put to the test. I have seen iron forged by a powerful blacksmith with the heaviest sledge hammer on the heaviest anvil laid on a man's chest. Something is to be deducted, of course, from the effort of sustentation, for the recoil of iron from iron. Then the heaviest men in the room tried their weight on him by jumping on his chest, which he bore with impunity; all he required was to draw a deep breath occasionally, distending the chest, expelling a little as he closed the glottis sharply with a "hic," as pavours do ramming the street, or woodmen felling a tree. I have picked up a bombardier knocked down by a 32-lb. cannon ball, spent, of course, but still having velocity and momentum enough to crush in his chest and kill the man, had it not been distended and the glottis closed. But he was an Arab, of great strength of frame and presence of mind; and I had previously taught him, as I used to do others with whom I

served, to keep the chest distended and the glottis closed when exposed to any encounter. So failing to evade the shot, which he tried to do, he only suffered a great shock, a great bruise, and a knock down. These examples will give an adequate idea of the great elasticity and resisting power of the chest, of the perfection of the valve of the glottis, and of the strength of the little thyro-cricoid muscle. The chest acts as a bellows as well as a wind-chest to the organ of voice and song. Its expulsive power is as great as that of its elastic resisting. It may be measured by the degree of condensation produced by the powerful diaphragm as well as by the excess of the area of that extensive partition above the area of the very small outlet of the glottis. See what an air engine does in excavating the tunnel through Mount Cenis; the diaphragm doing in our engine what the fall of water does in that. The chest is an air-gun, forcing-pump, and air-engine, capable of graduating every degree of power, from a scarcely perceptible breath or the gentlest sigh to the abrupt hiccup or the most violent expulsive convulsion of hydrophobia or hooping-cough.

But the reader may ask, What has all this to do with hooping-cough? Everything! But for this great power, every severe case of hooping-cough in infancy would be fatal by suffocation. But for it, also, we would not see those grave complications,

those illegitimate children of the parent disease, that ought never to have seen the light, and that never will, after a suitable and judicious treatment has been universally adopted : complications which have been the cause of all the uncertainty, confusion, and want of unanimity among the acknowledged authorities on the subject, and which have aggravated the difficulties and confounded the pathology of hooping-cough.

Let the reader contemplate such an engine, powerful even in an infant, set a hammering uncontrollably upwards against its sensitive, delicate, and minute glottis—still hammering, with intervening rapid snatches of sonorous inspiration, for nature will make no compromise with suffocation, the agonies of which the poor infant is enduring—hammering until it succeeds in expelling through a passage too small to let it easily pass, a tough, glutinous, sticky mass of secretion collected there in the top of the trachea, and he will have all the phenomena of hooping-cough.

CHAPTER V.

PATHOLOGY.

THE nature of hooping-cough is an inflammation of the upper portion of the trachea, which causes a thick transparent glutinous secretion; this, when it amounts to a certain bulk in that part of the trachea which partakes of the great sensitiveness and nervous associations of the larynx, excites coughing for its expulsion. The glottis is too small—only three lines long, up to the age of two years—to let the tough and sticky mass pass; the cough is reiterated again and again with great rapidity and violence to force it through; it cannot; the sense of suffocation is awful; the lungs are exhausted of air; the air rushes in to fill them, and with such force and velocity, as to set the chordæ vocales in vibration and to produce the hoop, and to carry back the partly-expelled secretion; and until the secretion is driven out, the cough is continued and the hoop repeated.

These are the phenomena that constitute hoop-

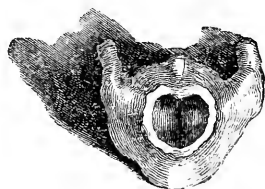
ing-cough, and few and simple as they are, they make one of the most painful and frightful diseases that fall on man or child. But it falls on childhood only, on account of the extreme susceptibility of the top of the trachea, and of the conformation of the larynx, and of the smallness of the glottis at that age.

That this is the true pathology of whooping-cough I believe, for the following reasons. I have repeatedly, and with great care, pains, patience, and opportunity, examined children of the ages of from six months to seven years labouring under the complaint in its matured and uncomplicated form; and I have found the lungs, the bronchi, and the lower part of the trachea free from any manifestation of disorder in the intervals of the fits of coughing, and the breathing natural, smooth, and easy. At the upper part of the trachea, the breathing I have observed to be dry and rough, and this at the access of the complaint, and before the peculiar secretion has been formed. There is also tenderness in this spot, manifested by the shrinking of the infant on pressing it, and by the description of elder children. When the thick secretion is formed, large crepitation and the peculiar sound of interrupted or broken breath may be heard confined to that spot. I have often drawn out and examined this matter. It is a transparent, glutinous semifluid, such as is known to be the

product of inflammation of mucous membranes in other parts of the body, as of the lungs in pneumonia, and of the colon and rectum in dysentery. It is, very rarely, of a pale rose tint when vascular action is high; amorphous, only slightly streaked on the surface with mucous corpuscles and pus globules; albumino-gelatinous, drying and coagulating irregularly, and having the reactions of blood, of which it seems to be the most substantial part.

But the properties that concern us here are its consistence and glutinousness, which are exactly the same as of the inner concentric sphere (there are two) of the white, enclosing the yolk of a perfectly new-laid egg. Let the reader imagine a globule of

FIG. 3.



The top of the trachea cut off below the first ring, showing the fissure of the glottis and outside of the larynx inverted. Age nine months.

this viscid matter secreted by and blocking up the top of the trachea, as here represented the size of life in a child of nine months, the period at which the complaint is about the worst, and view the

minute aperture of the glottis, only three lines long, represented by the black line on the centre, through which it has to pass, and let him bear in mind the spreading effect of the force of the cough acting against to expel it, and he will understand the difficulties of, the necessity of, and the intensity of the cough in whooping-cough.

The hoop is produced by the in-draught of air to fill the lungs exhausted by the reiterated cough, setting in vibration the elastic ligament of the chordæ vocales which are passive, and widening the glottis. Being by a reversed action smothered inwards, it is not the tone of crying enforced by the powerful bellows of the chest and enlarged by the natural outlet. That there is no spasm, the pitch and volume of the tone tells, which proclaims the width of the glottis, one being the measure of the other. The opening of the glottis in infancy is so small that reducing it further by spasm would close it altogether, and stop breath and voice for ever.

Those who have written of spasm of the glottis have not shown when, how, or where it occurs. The only spasm in whooping-cough is that of the cough, which is remedial. So that it is not

A spasmodic disease,	Nor a nervous one,
Nor catarrhal,	Nor bronchial,
Nor pulmonary,	Nor one of the brain or its membranes,

Nor of the medulla oblongata, Nor of the respiratory tract or nerves,
Nor of the blood, Nor of the air,
Nor of the digestive organs, Nor of the liver,
Nor of an insect ;

But inflammation of the upper part of the trachea, aggravated by the peculiar conformation of the adjoining and continuous outlet, the larynx.

CHAPTER VI.

SPASM.

SPASM is so constantly associated with whooping-cough in books, that I think it worth while to examine here what it is, and what it has, as well as what it has not, to do with the complaint.

Spasm is the involuntary contraction or action of a muscle, a set or several sets of muscles co-operating in unison or harmony. It occurs in every period of life, as well as before birth and after death; and in every degree of force and times, from the faintest sigh or yawn to action so violent and rapid as to tear a muscle, rend a tendon, and break a bone; and in the lower animals, as in the crab, as to jerk off a whole limb. It partakes in some of our natural actions, and gives tone and marked expression to some of our higher emotions. It is caused by certain excitement or irritation, natural or morbid, in that part of the nervous centres from which the muscles affected receive their nervous supply; generated there, conceived by the mind, or communi-

cated from other parts, external or internal. Spasm is not the random and disorderly action of the muscles that is generally supposed, but has its purposes and its uses, in health as well as in disease. Its agency was said, in earlier and later times, to be active in making and modifying diseases in which it had nothing whatever to do, or interfered only as a remedy. It plays a great part in many diseases, and constitutes all the symptoms in a few, and these the very worst. Spasm, I am sure, is never a disease in itself, but always useful and remedial, either as performing a natural function, accomplishing a remedy, giving a salutary warning by resenting some infringement of a wise rule of conduct; or as giving a pathological indication of the seat and cause of disease. In hooping-cough, the remedial effect of spasm is the cough that expels the secretion, which if allowed to remain, would cause suffocation and death. There is no spasm of the glottis, because it is not useful in so small a passage as that of the infant, but would be hurtful and would cause death. The only spasm that I believe occurs in the glottis is where some minute matter difficult to remove, as a portion of bristle or the like, sticks in the glottis of an adult, and greatly irritates it. When the respiratory muscles cough violently to reject it, those of the larynx co-operate to narrow the glottis spasmodically, thereby to present more directly the object

to the expulsive force, and by such narrowing to increase the power of that force, the blast of the cough. When spasmodic action appears most unaccountable and incongruous, it may be but the disturbance of the motions of the human system, which, if scrutinized with the assiduity and exactness by physiologists, that the perturbations of the motions of our solar system receive from astronomers, may meet with a reward as great as the discovery of a planet. So much do I think of the importance of spasm as a pathological indication, that I am not without hope that some day, when it is followed and interpreted with acuteness and discrimination, it may lead to a discovery that will render no longer incurable that appalling spectacle hydrophobia, the pain of merely witnessing which does not end with the life of the victim.

CHAPTER VII.

CAUSES, CLIMATE, SEASON, INFECTION.

THE cause that predisposes to hooping-cough is the high organization, the susceptibility, and the conformation of its seat, already described as peculiar to infancy, and which alters and declines with adolescence.

The cause that excites it is damp and cold, especially when coming together by a sudden change from better weather.

The climate and seasons of Great Britain are such as to expose it to such contingencies, and to subject it more than any other land to hooping-cough. These conditions the country owes to its accidental and insular position, which exposes it to two winds from opposite points, that are as opposite in their nature—the north-east, cold and dry, and the south-west, warm and moist; and it is the one coming on the other, the cold when there is much wet about, that causes so much disease of the lungs and air-

passages as we suffer from, the changes being as variable and sudden as the winds themselves.

It is interesting, and instructive for its own sake, to consider how distant, the world over, are the causes that make our climate, and that modify our home influences. It so happens that the watershed of the mountains of Siberia is towards the north, and much of the waters of the rivers never reach the sea, but spreads out and freezes over the country, never entirely melting in the hottest summer, and setting a perennial layer of ice under the surface. This is what makes that land ungenial and penal, and the wind that blows from it intensely cold and dry, as it leaves all its watery vapour, in the shape of snow, behind it. In the opposite direction, the conformation and outline of the Gulf of Mexico, the high temperature of the water and other causes sets a current of warm water, called the Gulf Stream, through the cold Atlantic Ocean northwards, that does not lose the last of its speed and of its warmth until it reaches the Arctic Circle. The south-west wind brings the warmth of the stream, and the warmth brings the more moisture to the shores of the British Islands, giving them a temperature higher than other lands in the same latitude; and with the cold north-east wind subjecting them to greater and more sudden alternations of weather. Places in the same latitude as England, that are frozen up all the winter—as Canada and parts of

the north of Europe—though colder, are more equable and constant, and suffer from the hooping-cough only when, late in the fall, the weather is variable and damp as the snow is falling and settling, and in the spring, when it is breaking up and thawing.

The thirty cases which gave occasion to this essay, present as good an illustration of the influence of climate and weather as to causation in this disease, as any that may be met with. The area in which they occurred is about four miles, two on each side of the centre of the Malvern Hills, which are about six miles long, ranging nearly north and south, and about six hundred feet high. For certain climatic reasons of winds, soil, and sun, the harvest is a week or two later on the west side, which is Herefordshire, than on the east side, which is Worcestershire, the hills being the boundary. It is remarkable then, that, on that side, the west, twenty-seven out of the thirty cases occurred. The reasons are that the soil is colder, and though high, wetter, being mostly of clay, than the east side, which though low is gravelly; and that the west side is a good deal screened by the hills from the morning sun, which is more heating than that of the evening; and that it is exposed to the west and south-west winds, which are wetter, more than to the east winds, which, though colder, are drier.

This shows how much wet and the nature of

the soil have to do with the modifying of climate, and how hurtful wet renders it to the human constitution.

The explanation of the hurtfulness of damp to human health is this: The air, saturated with moisture, is unable to absorb from the extensive surface of the body a recrementitious and effete matter, which is discharged in an invisible vapour through this its natural and healthful outlet. The humours so retained are thrown in, and embarrass important internal organs, making a hotbed and pabulum of disease. Damp also chills, checks, and repels the circulation of the blood on the surface of the body, making it pale and cold, as the countenance and complexion of the inhabitants of such a locality betray.

Hooping-cough falls almost always as an epidemic, showing it to have a climatic, atmospheric, and extensive cause. Many seasons of spring, fall, and winter, pass with pleasant and favourable weather, and without the appearance of a case of this disease, confirming this conclusion. This is an argument against contagion as a cause, which would be independent of weather, which the complaint is not.

Infection.—As to its cause in contagion or infection by a miasm in the air or from the body or breath of a patient, I am not able to speak positively. I never saw a case, though I was always

on the watch for it, where the complaint appeared to be communicated from one child to another in a situation that was not, by its circumstances of locality, cold, damp, and exposure, likely to excite it independently ; therefore I do not believe that it is contagious. But that it has such an origin is stated so positively by most writers, that I cannot contradict it. The immunity secured by separation I infer to be due to the care taken, and to the protection used against other causes ; and to be no proof of contagion.

CHAPTER VIII.

D I S E A S E — S Y M P T O M S .

AFTER some exposure which may not have been noticed, the child sickens, and is found to have a cold. It loses its animation, and droops; is careless of its food, and refuses it; its bowels are out of order, tongue and breath foul, and alvine evacuations most generally numerous, forcible, and offensive: next comes the cough in a day or two, and if uncomplicated with bronchitis, careful examination of the lungs and air passages will give all the sounds smooth, free, and natural, except at the top of the trachea, where they are rough and dry; and tenderness will be found by pressure on that spot. In infants, where it is most needed, it is not easy, but must have opportunity, time, and patience to make such an examination; and a small belled gutta-percha stethoscope which may be bent, will be of use. The peculiar viscid secretion, which has been already described, next forms, and necessitates the rapid, forcible, and

reiterated cough for its expulsion, and the intervening rapid sonorous inspiration called the hoop. When the patient is an infant, and the attack a severe one, and vascular action high, there is much fever. The cough occurs several times a day, frightens him out of his sleep at night, and overwhelms him with the feeling of instant suffocation, through the dread of which he is afraid to move, and the expression of which he wears in his aspect. The fit is continued until the viscid secretion of the trachea is discharged, but so great is the force that has been exerted in effecting this, that the mucus of all the air and guttural passages has been increased and driven out, sometimes streaked with blood; as have also the contents of the stomach, which generally ends the fit. The respiration and circulation are greatly interrupted. Blood is forced into the head, the face is swollen and livid; tears stream from the eyes, which are bloodshot; the lids turgid and venous, as in habitual asthma; and there is often bleeding of the nose. After the fit the infant is greatly exhausted; and in the progress of the disease, by the suffering, the want of sleep, and loss of food, becomes wasted, prostrated, and dispirited. The elder children of four or six years, if there be no bronchitis, which is a frequent complication, or rather an extension of the complaint, are pretty well and play in the intervals.

It is a disease of childhood only. The youngest

suffer most and longest ; are the first to be attacked, the last to get well ; the infant of one year continues ill long after the children of four, six, and eight have recovered, which they do in proportion to their ages, and the size of the glottis of each.

It lasts from two to twelve weeks, if not aggravated and protracted by severe complications or improper treatment ; and recovery takes place gradually under a curative change of weather, season, or climate, or other favourable circumstances ; so that doctors seldom get the credit of curing it.

The fact that it occurs only once in life, which is not without its exceptions, is not due to any immunity that having had the disease confers ; but to the peculiarity of its not having the whole of life to range over, but the few first years, to which only hooping-cough is incidental ; and these few years are further reduced by those that bring fine weather, such as does not excite the complaint.

Recovery is spoken of as taking place gradually, as it does in almost every case ; and death in simple hooping-cough occurs very rarely, and only in constitutions so weak as not to have power enough to enable the cough to expel the viscid secretion, and the child dies of suffocation. The high numbers that represent the complaint in the bills of mor-

talities are not raised by it, but by its many and dangerous complications of the head and lungs, particularly of the latter, which are not unreasonably set down to the disease in the course of which they arise, and that causes them.

CHAPTER IX.

COMPLICATIONS.

THE complications that arise in the course of hooping-cough, and that are caused by it, are naturally said to be a part of it; and they are the greatest, worst, and most dangerous part of it. But they are, notwithstanding, distinct and different complaints, and require distinct and different treatment, and sometimes such as is incompatible with that of the primary one.

When we consider the great mechanical power of the great air-engine, the chest, and the force and pertinacity with which the cough directs it, it is no wonder that the delicate, sensitive, and immature structures and tissues of the child and of the infant should give way before it, and produce various disorganizations that make the worst and most unmanageable forms of disease.

The violence and persistence of the cough is so great as very often and very much to interrupt and to derange the circulation and respiration; the air

is forced inwards as well as outwards in the lungs, dilating the smaller bronchi, rupturing many of the delicate air vesicles, running them together, and causing emphysema. The circulation through the heart and lungs is often interrupted, and the oxygenation of the blood prevented. The momentum of the circulation is such as to engorge the mucous membranes of all the passages whose outlets are upwards, as the *primæ viæ* and air passages. The capillary circulation is forced also, causing extravasation in the terminal bronchi, in the air-cells, and in the parenchyma, making clots that block the passages of the air or blood, and laying the train of further and future mischief, as wasting or inflammation, or any other form of disease that an overwrought impulse of the minute vessels can produce. The impulse into the head is still greater, because it is terminal and resisting, and produces engorgement of the membranes, and not unfrequently extravasation on the surface, and perhaps in the tender and immature substance of the brain itself, and often causing exudation of serum on the surface or in the ventricles, and if at the base, exciting convulsions; or it may initiate hydrocephalus, should the constitution predispose to it; or the pressure alone may cause diminution or depravation of nervous power, and possibly paralysis. All these effects as to force and pressure are exhibited outwardly and to the sight on the head

and face, as described. The medulla oblongata and other parts of the nervous spinal cord suffer similar injury. The mischief of the force is not upwards only, but downwards also, for it has caused hernia both in the umbilicus and in the inguinal canal; and it has exhibited itself in fulness of the tips of the fingers and toes. Perhaps no part may escape the effects of such a force, and parts of the alimentary canal and liver may be found engorged.

All these morbid changes are but the effects of inordinate force and pressure of the respiration and circulation caused by the primary disease; and when it is reduced to a minimum, as I have proved it can be by a reducing and soothing treatment of it, these morbid changes and their results in various diseases will be seen no more.

Death from uncomplicated hooping-cough very rarely occurs, and the opportunity of examining the morbid appearances still more rarely or never; so that when a surgeon has an occasion of examining a body registered dead of that disease, he sees the appearances of the consequences and complications more than those of the primary, which they greatly exceed in magnitude and importance. Indeed, the marks of the primary may have disappeared with life; at least one of them, the vascularity of the top of the trachea, the glutinous exudation alone remaining. It is a pathological fact, that the minute vascularity of an active disease or

inflammation will vanish with death, when that of a passive vascularity or engorgement, varicose state, and of course extravasation as being dead blood, will remain. I have seen this, all three states at once, on the same limb after death, where there had been a most acute superficial inflammation, or erysipelas, which caused both engorgement and extravasation. The vascularity of the active inflammation had disappeared, and the consequences, the ecchymosis and engorgement, remained. I have seen this even during life, when in syncope caused by bloodletting done for the cure of an acute inflammation of the conjunctiva or sclerotic, all the vascularity of the capillaries of the surface of the eyeball had disappeared, and that which was passive, engorged, or varicose remained.

The surgeon who has an opportunity of making a *post-mortem* examination in hooping-cough observes the appearances described, not all, of course, to be found in the same case; he carefully notes them down as the morbid appearances of the disease; he takes no account of what he does not see, and what may have disappeared with life; he may not have been sufficiently patient, comprehensive, and searching in his scrutiny of the pathological importance and relation of priority and sequence, of organ and process, natural structure and morbid change, but takes the changes and appearances that strike him most, be they of the lungs or the brain,

or of any other department, as the essence and cause of the complaint. Another comes to the same conclusion as to other and different appearances which are the most striking in his case; a third does the same. They cannot all be right. They are, most probably, taking the consequences and complications for the cause of the complaint itself, which are few and slight, and which may have wholly or in part disappeared. In this way, it appears to me, may have arisen and be accounted for the many various and dissentient doctrines that prevail as to the nature of hooping-cough.

CHAPTER X.

TREATMENT.

ROUTINE does half the practice of medicine, but of hooping-cough it does a very broken fraction. What route can a zealous man take, mazed amid so many ways, not being able to determine which guide to follow? The prudent school follows the most judicious guide, one who has had as much experience, tried as many remedies, judged as acutely as most men—an eloquent writer on medicine, a skilful practitioner—and a successful man—what better guide? Yet all that the knowledge and opportunities of this teacher enabled him to advise as best, is to watch, and wait, and superintend the disease while it runs its course. The heroic school rises and says, What! lapse into a nurse? No, not even under the guidance of the President of the College of Physicians who advises it. I'll not submit to this humiliation. I'll attack the disease, and subdue it. What have we all the powerful armoury of the Pharmacopœia for? What cannot steel, and lead, and silver conquer; besides

mercury, zinc, and arsenic? So he sets to. The spasmodic school says, I am not to be frightened by fits or faces. Did not Providence give us those blessings — opium, henbane, hemlock, foxglove, deadly nightshade, aconite, Indian hemp, prussic acid, &c., as well as special antispasmodics, to use them? So he uses them, and poses the spasm and the patient too. There is the scientific school, that sees farther into the nature of things than its neighbours; that knows that one light set against another extinguishes it, and one sound against another, in a certain way, produces silence; that like cures like, similia, similibus, &c.; that “one fire puts out another’s burning;” that cures ague by lodging it in a swamp, and the itch by treating it with vermin; that knows that the greater spasm may absorb or annihilate the lesser. So, without assuring itself that such spasm exists at all, he administers strychnine, and to an infant! but of course in such minute doses as would incline in practice, as it does in principle, to homœopathy, and as would make that sect conceited. But banter, though it only veils a vexatious truth, will not salve the gall of humiliation, and that humiliation I have felt when, in early days, in dealing with this disease, I did not know what I was doing, why I did it, and what that was I was doing it for. But I did only as I was taught, and that teaching prevails to the present day, and has become more desperate.

No disease has been treated with so many remedies, because no disease has been honoured by so many theories of its nature ; and like all incurable and intractable diseases, none has met with such desperate treatment — that of administering the most deadly poisons. One wonders that responsible men should incur the risk of using such drugs with such delicate and susceptible subjects, most of whom have not yet speech to express their feelings, or exclaim against the wrong done them. Who knows the nature or the effect proper of *nux vomica* or strychnine on the animal economy, or its curative effects in disease? I ask any one who may use it, and who may read these lines, to do me the great favour of telling me why he does so, and what are its physiological properties in health and in disease. I can get no satisfactory answer to this question in books. Let those who incline to it try it on themselves first, or on their children if they love them. The most we know of it is, that it is in great request as the most deadly and immediate poison, and one difficult to detect, by intentional poisoners. Most of the antispasmodics and powerful sedatives I have named are only less hurtful. There are simpler ways of curing the toothache than knocking a man's head off. Why should infants be stupefied, or spasm allayed? Spasm is a remedial effort of nature to expel that from the

glottis by the cough which, if not expelled, would cause suffocation. Where that spasm is not, or where it is not forcible enough in whooping-cough, the child dies. A wise physician ought to take his cue from nature, and second her, instead of trying to oppose her with his antispasmodics and sedatives, which he does in vain : then as to spasm of the glottis, for which these poisonous drugs are professed to be given, there is no such spasm. You need not rise from your chair, or turn your head to assure yourself of this. The tone of the hoop tells it ; the glottis in infancy is so small, that any reducing or closure of it by spasm would give the shrill, acute note of a mouse or an insect, or more likely none at all, but stop tone, and breath, and life for ever. Proper treatment has often been used, but it has not been advised and persevered in with the certainty and confidence that the conviction of doing what is right and the best that can be done, inspires.

No wonder, then, it is, that the complaint is so often left to the care of the nurse, the old woman, the quack, quack medicines, and to nature, as well as to the physician ; and to all with the same results as to recovery. This is the reproach that we confess to.

There are some diseases before which a medical man is hopeless, though he may not feel discom-

fited—as cancer, consumption, hydrophobia. But hooping-cough is not to be ranked with these ; though discomfited, he must not be hopeless.

If my view of the nature of the complaint be the true one, the treatment I am about to suggest is as obvious and simple as its pathology. It is—to soothe and allay the inflammation of the top of the trachea, and thereby

To thin, reduce, and stop the secretion of its glutinous exudation.

To correct the state of the bowels, or of other organs disordered.

To support the spasm of the cough by supporting the strength of the patient.

The child or children suffering from hooping-cough, or suspected to be, ought to be kept in a room with an equable temperature of not less than 60°; and to make the warm air more soothing to the inflamed air-passage, a kettle of water ought to be kept boiling on the fire, or in an urn on the table, discharging its steam into the room. Older children might inhale air mixed with the steam out of a jug of boiling water half full, or other suitable vessel. I have tried dry warmth, and did not find it so good. If the bowels are out of order, as stated in the symptoms, either of the following powders, according to age, may be given as required, with a little magnesia occasionally to allay irritation :—

R Hydrarg. chlorid. granum.
Carb. magnesiæ granum.
Sacchar. albi grana duo. Misce.

To an infant up to fifteen months.

R Hydrarg. chlorid. granum.
Pulv. rhæi. grana quinque. M.

To a child above that age.

If the child is robust or plethoric, and vascular action and fever be high, one small leech may be applied to the trachea, and watched of course. But taking of blood is seldom necessary. To reduce the inflammation, thin the secretion, and promote its discharge, I find the following mixture the best:—

R Nitratis potassæ, gr. xv.
Aquæ destil. ℥vj.
Liq. antim. tart. ℥ij.
Syr. scillæ, ℥iv.
Spts. æther. chlorici, min. xx.

A teaspoonful for a dose up to the age of two years, two above that age. The nitrate of potass or the chloric ether may be omitted, or ipecacuan wine substituted for the antimonial, which I find best. The formula is given merely to embody an idea, and may be varied according to the character of the case. If bronchitis happens to be coincident, the same treatment answers. The chloric ether allays irritation without stopping, but rather helping, the

cough.* This dose I find best to give, avoiding meal times by an hour at least, before the time the fits may be expected, and repeated within half an hour sometimes at discretion, either to produce nausea or sickness, which thins, and enforces the expulsion of the viscid secretion. Repeating the medicine once or even twice within an hour, sometimes, but not often, at the beginning of the night, secures a good night; but it should not be done every night. A band of cotton wool should be worn round the throat. Counter-irritation on the front of the neck is of great value, but to a young infant the choice of which, requires discretion. Mustard-plaster paper is the least objectionable, a very small piece put on a different part every or every second day; to elder children, a liniment of croton, reduced by twice its bulk of castor oil, a few drops rubbed twice a day with care, till it brings out a rash, which is to be renewed as it declines, or a small slight blister, though this may make a troublesome sore. The child or children should be well supported by beef tea, and if much exhausted after the fit, might get a teaspoonful of wine. When the child is old enough, he ought to be taught to take in a long inspiration when he

* Not the pharmaceutical mixture of the last Pharmacopœia, which is decomposed by water, exposing the patient to the risk of taking pure chloroform from the bottom.

feels the fit coming on, as it makes it more effective and shorter. It can also be shortened by hooking with the finger, or catching with a pocket-handkerchief, the tough secretion when it gets half through the glottis and shows itself at the back of the mouth, and pulling it out. It is just as necessary to support the mothers or nurses of those at the breast, whose milk may be reduced or impaired by fretting, fatigue, and want of sleep. They should get broths, milk, or ale. This is all that is necessary. It must be borne in mind that the disease is an obstinate one, and that to succeed in curing it, the doctor must be more obstinate, and persevere, and he will cure it. The best tonic is fresh air, to go out in it, or open the windows, when the weather is dry and sunny, and when it can be done with safety. A change to a warmer or drier locality, or to the seaside, is most desirable when it can be done.

Thus treated there will be no serious complications. If they should be caused by, or arise in, the course of the complaint, they must be treated according to their respective indications, on which there can be no difference of opinion.

CHAPTER XI.

PREVENTION.

THE proverb "Prevention is better than cure," is most applicable to diseases that are hard to cure, such as the one we are treating of; therefore we ought to inquire what can be done for that purpose. Any precaution advised equally applies to all other diseases of the lungs, as well as to rheumatism. Sickly districts have been made healthy, and disease on a large scale prevented, by what is now well known as sanitary improvements, that is, by making places clean, lightsome, and fresh-airy; and by draining off and damming out stagnant water. Hooping-cough has only a partial origin in its own locality, which it may not be convenient for a family to quit. Its great cause is far away, in different and opposite regions, and winds which we cannot reach or alter, and which make our climate the inconstant one it is, and suddenly changeable. Then, as we cannot alter it, we must adapt ourselves to it. And how? The Russian used to

dip his new-born child in the cold river, or if that was frozen over, roll it in the snow, to make it hardy. In the middle ages, innocence or guilt was proved by the ordeal of battle, or of fire, or of water. So this is the proof of vitality by the ordeal of cold; and a much better one it was or is, than that practised by our mothers in this country, for it settled the matter quickly, and did not allow time to get attached to a child that you were soon to part with. Whereas our mothers do the same thing slowly and more cruelly, by exposing, not for a moment, but for years, the head, neck, shoulders, chest, arms, and knees of their children to the cold. This ignorant practice, as explained in the chapter on climate, drives the blood that ought to keep the surface of these parts in a glow of health and insensibly perspiring, into the internal vital organs, as the brain and lungs, and other parts, to be there ready for any mischief, like petroleum in a railway train, and sooner or later, if any exciting cause occurs, to cause baldness, madness, consumption and other diseases of the lungs, white swellings, crippled knees, rheumatism and scrofula, which so unfortunately distinguish this country from the rest of the world. If nature intended these parts of the body to be naked, she would have covered the rest with hair. But the poor children, if fashion exact the nakedness of parts of their bodies, then let it be some part that can bear the exposure

with impunity, as the part that gets the whippings. I address myself here to some strong-minded mother and leader of the fashion. And this is done to make them hardy—hard cold clay I have seen the usage make many a lovely and promising child—done by the fatal prudence of a loving mother.

An ingenious surgeon invented a respirator, to be worn on the mouth out of doors in cold weather; a metallic strainer of several little plates, to warm the air inspired by keeping some of the warmth of the air expired; but it keeps in the dregs of it too, which is recrementitious and hurtful, and restrains the full distension of the chest which is necessary for the health of the lungs. A philanthropic gentleman went about London a few years ago, giving every one he met suffering from difficulty of breath or cough a little tin scone with a bit of candle, which, hung at the breast and kept burning, was to cure and prevent diseases of the chest for ever, by warming the air breathed; but it let in irrespirable air from the decomposition of the combustion of the tallow or wax as well as smoke, so it would not do. Both gentlemen shut their eyes on their noses, one of the uses of which is to warm the air breathed, which is done by drawing it in over surfaces multiplied for the reception of odours, and this it does without depraving it.

But it is unsound prophylaxis to attempt to adapt the elements to us, and it is impossible: it is

wisest to adapt ourselves to them, which can be done by habit and very little trouble or expense.

Children should be trained to become independent of the sudden changes and extremes of weather ; and this is best done by clothing them next the skin in flannel, thicker or thinner according to the season, to the neck, wrist, and ankles. This keeps the surface at an equable temperature, which is not affected by the changes from warm to cold, from dry to damp. I even advise night-dresses of flannel, for then they can throw off the bed-clothes at night, which they often do, or have more air about them or even open the windows, with impunity. Everything that makes a child strong enables him to resist disease ; and animal food especially, such as milk, eggs, meat, and fish, which are the best strengtheners, also warm the body, and so enable it to resist the effect of changes of weather that produce diseases of the lungs and air-passages. Early to bed, early to rise, plenty of sleep and all other common-sense ways. The bowels should be kept open, not altogether for the necessity of regularity of that great function, but also to save the occasion of giving children physic, which injures so many by being made a habit ; and it ought to be done as much as possible by articles of diet, which every mother or nurse knows. Cold sponging and bathing, done quickly and not too much of it, in the morning, is the best mode of making children hardy,

and inuring them to cold; and lastly, to be out in the air and taking exercise in all weather and seasons, when not wet or very damp—the windier the better; mounting heights and hills, so as fully to expand the lungs; and to keep the mouth shut and breathe through the nose, so as to be able to do it when the weather is extremely cold. Such gymnastics as enlarge the chest, enlarge the lungs too, and render them less liable to disease. Climbing with the arms alone, running, rowing, cricket, hand ball, football, &c., in moderation, for boys; and for girls as much open air as possible, walking briskly, mounting hills or heights, so as fully to expand the lungs, as the stagnation of respiration is very likely to initiate that condition that induces consumption. Skipping-rope, and especially shuttlecock, as throwing out the arms and expanding the chest, are most beneficial; and I keep for the last, as having many advantages, dancing, that girls are so fond of, that rouses the languid circulation, and prevents that sapping infirmity of young girls, cold feet; that conduces to dignity of mien and grace of movement; that cultivates a musical taste, and enforces a correct sense of time. Often in foreign parts, when witnessing heathen modes of prayer, wound up with a dance, did I wish that it could in some way be introduced at home after night prayers, so as to send the young girls to bed with warm feet.

POSTSCRIPT.

IN this essay, which, though somewhat discursive, is not long, I attempt to explain what is obscure, to simplify what is complicated, and to account for the numerous and various theories of the pathology of hooping-cough which prevail, and to reduce them to one. I attempt to prove that one new and true, by demonstrating as far as can be done on paper, the seat of the disease, and its natural structure and functions, as well as its altered or morbid structure and functions, that constitute the complaint. To show that other morbid appearances in the brain, lungs, and other viscera, are caused by the violent action of the primary disease, and are its consequences only, and not its cause, as they have been taken to be. The proof will depend on the consideration this doctrine will receive from the profession, and on the final ordeal of experience and practice by which, I hope, it will be tried, and on the successful result of which, I have the utmost confidence.

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